

Evidence of an Increasing Prevalence of Diagnosed Diabetes Mellitus in the Poole Area From 1983 to 1996

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This study examined the prevalence of diagnosed diabetes mellitus in a defined population over 13 years by undertaking cross-sectional surveys on 3 occasions between 1983 and 1996. The study population consisted of all the people registered with 10 general (primary care) practices at the time of each survey; 90 660 in 1983/4; 97 122 in 1988/9; and 86 287 in 1996. Ascertainment of cases was by a surveillance programme in general practice and the hospital diabetes department. The number of diabetic patients increased significantly over the study period: in 1983/4, there were 917 patients, crude prevalence 1.01 % (95 % CI 0.95–1.08 %); in 1988/9, 1150 patients, crude prevalence 1.17 % (1.12–1.25 %); and in 1996, 1604 patients, crude prevalence 1.86 % (1.77–1.95 %). The prevalence adjusted to the age and sex distribution of the UK was 0.97 % (95 % CI 0.90–1.03 %) in 1983/4, 1.05 % (0.99–1.11 %) in 1988/9 and 1.55 % (1.48–1.63 %) in 1996. The main increase in prevalence was due to Type 2 diabetes mellitus, crude prevalence 0.75 % (95 % CI 0.69–0.81 %) in 1983/4, 0.92 % (0.86–0.98 %) in 1988/9 and 1.52 % (1.44–1.60 %) in 1996 rather than Type 1 diabetes mellitus, crude prevalence 0.25 % (0.21–0.28 %) in 1983/4, 0.25 % (0.22–0.28 %) in 1988/9 and 0.34 % (0.30–0.38 %) in 1996. During the study period, the crude prevalence of diagnosed diabetes was significantly greater in men than women; in 1983/4 men 1.1 % (95 % CI 1.00–1.20 %) versus women 0.93 % (0.84–1.02 %); in 1988/9, men 1.31 % (1.21–1.41 %) versus women 1.07 % (0.98–1.16 %); and in 1996, men 2.13 % (2.00–2.27 %) versus women 1.60 % (1.49–1.72 %). This difference was statistically significant in the 1988/9 and 1996 surveys. In conclusion, over 13 years there was a significant increase of 83.6 % in the prevalence of diagnosed diabetes mellitus in the Poole area, with the UK age and sex adjusted prevalence increasing by 60.7 %. © 1998 John Wiley & Sons, Ltd.

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Introduction

Diabetes mellitus is a chronic incurable disease associated with premature mortality and high morbidity from its long-term complications. It is recognized to place a large burden on health care services.¹ There has been some evidence of an increasing prevalence of diabetes in the UK.^{2–4} The incidence of Type 1 diabetes mellitus has doubled⁵ but this type of diabetes accounts for only 20–25 % of people with diabetes in the community.

In 1983/4, a survey was undertaken in the Poole area to document the prevalence of diagnosed diabetes mellitus and diabetic kidney disease.⁶ A further survey was undertaken in the same population in 1988/9 to establish the prevalence of diagnosed diabetes mellitus

and diabetic foot disease.⁷ In 1996, a new research project was commenced including the previous study population to investigate the prevalence and incidence of Type 2 diabetes mellitus over a 3-year period. This paper examines the changes in the prevalence of diagnosed diabetes mellitus from 1983 to 1996.

Methods

The population included in the 1983/4 study was based on all the people registered with 40 general practitioners (GPs), working from 10 general (primary care) practices in the Poole area. In the UK, all residents are registered with a GP for primary health care. The 1988/9 survey involved the same 10 general practices. The area involved in the surveys is a mixed urban and rural district with a mainly Caucasian population.

The methods used in the surveys of 1983/4 and 1988/9 have been described elsewhere.^{6,7} Briefly, a surveillance programme was undertaken for 18 months in the 10 general practices to identify all the diagnosed diabetic

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patients. Sources included the repeat prescription requests, hospital letters, practice diabetic registers and the hospital diabetic clinics, and diabetic computer system. The hospital diabetes register has been developed over the last 20 years; the main source of patient information has been from the hospital diabetes clinics and the optometrist-based community diabetic eye screening programme.

In 1996, the 10 practices were asked to participate in a further survey. Eight practices agreed, one practice was undergoing major organizational change and declined to take part and one practice had ceased to exist, following the retirement of its single handed GP. The remaining eight practices had well-established diabetic registers and undertook diabetes care in their own practices, claiming chronic disease management payment. The diabetic patients were identified in 1996 by combining the practice diabetic registers with the hospital diabetic computer register, checking that any patients identified through the hospital list were currently registered with the practice.

In each survey, the 1985 WHO diagnostic criteria for diabetes mellitus were used⁸ and patients' records checked to ensure they fulfilled these criteria. Patients in whom the diagnostic criteria were not fulfilled were invited to have a glucose tolerance test and those not meeting the WHO criteria or refusing the test were excluded. If they had been treated continuously with insulin (or had had a break of less than 1 month off insulin since diagnosis) or had suffered from a documented episode of diabetic ketoacidosis, the patients were classified as having Type 1 diabetes mellitus. All other patients were classified as having Type 2 diabetes mellitus.

The study population consisted of all the patients registered with the GPs working in the 10 practices at the time of the 1983/4 and 1988/9 surveys and the 8 practices in 1996. In 1983/4, the number was ascertained by a records count at each practice. In 1988/9 and 1996, the practices were computerized and provided an age/sex breakdown of the practice lists.

Statistical Methods

Age and sex specific prevalence rates were calculated for the study population. To extrapolate this to a typical UK population, age/sex adjusted rates were calculated using the 1991 UK census data⁹ and direct standardization applied. Ninety-five per cent confidence intervals were calculated for crude and standardized rates. Increases in the prevalence over time were assessed using a logistic regression model adjusting for age and sex.

Results

The study population consisted of 90 660 people in 1983/4 (although the age of 92 people was unknown and they were excluded), 97 122 people in 1988/9, and

86 287 people in 1996. The number of diagnosed diabetic patients identified in each of the three surveys is shown in Table 1. The crude prevalence of diagnosed diabetes mellitus rose from 1.01 % in 1983/4, to 1.18 % in 1988/9 and 1.86 % in 1996. There was a small increase in the crude prevalence of Type 1 diabetes mellitus over the study period (from 0.25 % to 0.34 %) and a large increase in prevalence of Type 2 diabetes mellitus (from 0.75 % to 1.52 %, see Table 2). The increases in the prevalence of diagnosed Type 2 diabetes mellitus between each survey were statistically significant and, although the prevalence of Type 1 diabetes did not change significantly from 1983/4 to 1988/9, the increase by 1996 was significant (see Table 3). The proportional change in prevalence over the entire study period was large, with an increase of 83.6 % (60.9 % adjusted) for all diabetes, 103 % (71.9 % adjusted) for Type 2 and 37.6 % (37.6 % adjusted) for Type 1 diabetes mellitus (see Table 3).

Table 1. The crude and adjusted prevalence of diagnosed diabetes mellitus in the Poole area

	Year		
	1983/4	1988/9	1996
Study population	90 568	97 122	86 287
Number of diabetic patients	917	1150	1604
Crude prevalence	1.01 %	1.18 %	1.86 %
95 % CI	0.95–1.08	1.12–1.25	1.77–1.95
Age/sex adjusted prevalence ^a	0.97 %	1.05 %	1.55 %
95 % CI	0.90–1.03	0.99–1.11	1.48–1.63
<i>Men</i>			
Study population	43 425	46 629	41 711
Number of diabetic patients	479	611	890
Crude prevalence	1.10 %	1.31 %	2.13 %
95 % CI	1.00–1.20	1.21–1.41	2.00–2.27
Age adjusted prevalence ^b	1.04 %	1.14 %	1.74 %
95 % CI	0.95–1.14	1.05–1.23	1.63–1.86
<i>Women</i>			
Study population	47 143	50 493	44 576
Number of diabetic patients	438	539 ^c	714
Crude prevalence	0.93 %	1.07 %	1.60 %
95 % CI	0.84–1.02	0.98–1.16	1.49–1.72
Age adjusted prevalence ^b	0.89 %	0.96 %	1.37 %
95 % CI	0.81–0.97	0.88–1.04	1.27–1.47

^aPrevalence adjusted to 1991 age and sex distribution of the UK.⁹

^bPrevalence adjusted to 1991 age distribution of the UK.⁹

^cAge of 1 female diabetic patient unknown.

Table 2. The prevalence of diagnosed diabetes mellitus according to type and treatment of diabetes in the Poole area

	1983/4	1988/9	1996
Study population	90 568	97 122	86 287
<i>Type 2 diabetes</i>			
Number of patients	679 ^b	896 ^b	1313
% of all diabetes	74 %	77.9 %	81.8 %
Crude prevalence	0.75 %	0.92 %	1.52 %
95 % CI	0.69–0.81 %	0.86–0.98 %	1.44–1.60 %
Age adjusted prevalence	0.70 %	0.79 %	1.23 %
95 % CI	0.65–0.75 %	0.74–0.84 %	1.16–1.30 %
<i>Type 1 diabetes</i>			
Number of patients	222 ^b	244 ^b	291
% of all diabetes	24.2 %	21.2 %	18.1 %
Crude prevalence	0.25 %	0.25 %	0.34 %
95 % CI	0.21–0.28 %	0.22–0.28 %	0.30–0.38 %
Age adjusted prevalence ^a	0.25 %	0.25 %	0.33 %
95 % CI	0.21–0.28 %	0.22–0.28 %	0.29–0.37 %
<i>Treatment</i>			
Insulin treated	356	401	504
% of all diabetes	38.8 %	34.9 %	31.4 %
Oral hypoglycaemic agents	358	442	760
% of all diabetes	39 %	38.5 %	47.3 %
Diet alone	187	295	395
% of all diabetes	20.4 %	25.7 %	24.6 %

^aAdjusted to the age distribution of the UK according to 1991 census data.⁹

^bSixteen patients in 1983/4 type of diabetes unknown and 10 patients in 1988/9 type of diabetes unknown.

At each time point, the crude prevalence was higher in the male than in the female population. Over the 13 years of the study period, the crude prevalence increased significantly in both sexes but was more marked in the male than female population (see Tables 1 and 3). Reviewing the age specific rates shows that the increase in prevalence of diagnosed diabetes mellitus is mainly due to higher rates in the older age groups; 30 years and older in men and 50 years and older in women (see Figures 1 and 2).

The age distribution of the study population is marginally different from that of the UK as a whole with an over-representation of the older age groups; in the Poole area, 14.8 % of the population is aged 70 years and over compared to 11.2 % in the UK as a whole. The results of the surveys have been adjusted to the age and

sex distribution of the UK (see Tables 1 and 2). The adjusted prevalence rates are lower because Type 2 diabetes mellitus is more common in the older age groups. The adjusted prevalence rates show the same trends as the crude rates and will allow comparison with other areas and extrapolation to the UK.

Discussion

This study has documented a significant increase in the prevalence of diagnosed diabetes mellitus over 13 years in a region of England, with the main increase due to an increasing prevalence of Type 2 diabetes mellitus. In the UK, there is a scarcity of good population data relating to the prevalence of diabetes mellitus but Table 4 lists results from studies comparable to ours. In the majority, the accuracy of the diagnosis of diabetes was not checked as carefully as in this study. More recent studies have quoted crude prevalence rates only which makes comparison with other areas in the UK difficult unless the age structure of the populations are similar.^{3,4,14,15} Nevertheless, the other UK studies support our findings of an increasing prevalence of diabetes mellitus in the last 10 years, with the latest study¹⁶ reporting a similar crude prevalence to Poole. This is in contrast to Iceland, where the prevalence of Type 2 diabetes mellitus has been stable for the last 20 years.¹⁷ The 'DARTS' project in Tayside studied electronic linkage of records as a way of setting up a register and establishing the prevalence of diabetes.¹⁶ Using all data sources produced a sensitivity of 96 % while hospital clinics and the eye screening unit had a sensitivity of 91 %. The Poole study included repeat GP prescribing, hospital clinics and the eye screening programme and so ascertainment should be similar.

The rising prevalence documented in this study may be due to a true increase in the prevalence of diabetes mellitus, better ascertainment of cases of diagnosed diabetes mellitus, improved or earlier diagnosis of diabetes mellitus, improved survival of diabetic patients or a combination of these factors. Similar methods were used for each survey, although in 1996 there was no surveillance programme, only the hospital and GP registers being used. This and the scale of the increase (83.6 %) makes it unlikely that the rise was due solely to better ascertainment of established cases of diabetes. It is interesting to note that the more marked increase in prevalence occurred during the second half of the study period and after the introduction in primary care of payment for chronic disease management. This, linked with audit, may have led to more organized diabetes care in general practice and heightened awareness. However, all 10 general practices have been involved in the Poole Community Care Service for diabetic patients since its inception in 1976¹⁸ and we suggest that the documented increase in cases is due to a true increase in the prevalence of diagnosed diabetes mellitus rather than better ascertainment of established cases.

Table 3. The percentage increase in prevalence of diabetes mellitus during the survey period

Type of DM or sex	Crude prevalence % increase	95 % Confidence intervals	Modelled prevalence % increase ^a	95 % Confidence intervals	Standardized prevalence % increase ^b
All DM					
1996 vs 1983/4	83.6	69.4–99.0	60.9	48.1–74.7	60.7
1988/9 vs 1983/4	16.8	7.2–27.4	7.9	–12.1–17.8	8.7
1996 vs 1988/9	57.1	45.7–69.4	49.1	38.0–61.0	47.8
Type 2 DM					
1996 vs 1983/4	103.0	85.1–122.6	71.9	56.4–88.9	75.2
1988/9 vs 1983/4	23.1	11.4–35.9	10.9	0.2–22.7	12.8
1996 vs 1988/9	64.9	51.6–79.5	55.0	42.1–69.0	55.2
Type 1 DM					
1996 vs 1983/4	37.6	15.6–63.8	37.6	15.5–64.0	34.4
1988/9 vs 1983/4	2.5	–14.5–22.9	2.5	–14.6–22.9	2.6
1996 vs 1988/9	34.2	13.3–59.1	34.3	13.3–59.3	31.0
Men					
1996 vs 1983/4	93.4	73.2–116.0	68.1	50.1–88.2	67.0
1988/9 vs 1983/4	18.8	5.5–33.8	8.9	–3.6–22.9	9.4
1996 vs 1988/9	62.8	47.0–80.3	54.4	39.0–71.5	52.6
Women					
1996 vs 1983/4	72.4	53.2–94.0	52.8	35.4–72.4	53.6
1988/9 vs 1983/4	13.7	1.2–30.0	6.8	–1.6–21.3	7.9
1996 vs 1988/9	50.3	34.5–68.0	43.1	27.8–60.3	42.3

DM, diabetes mellitus.

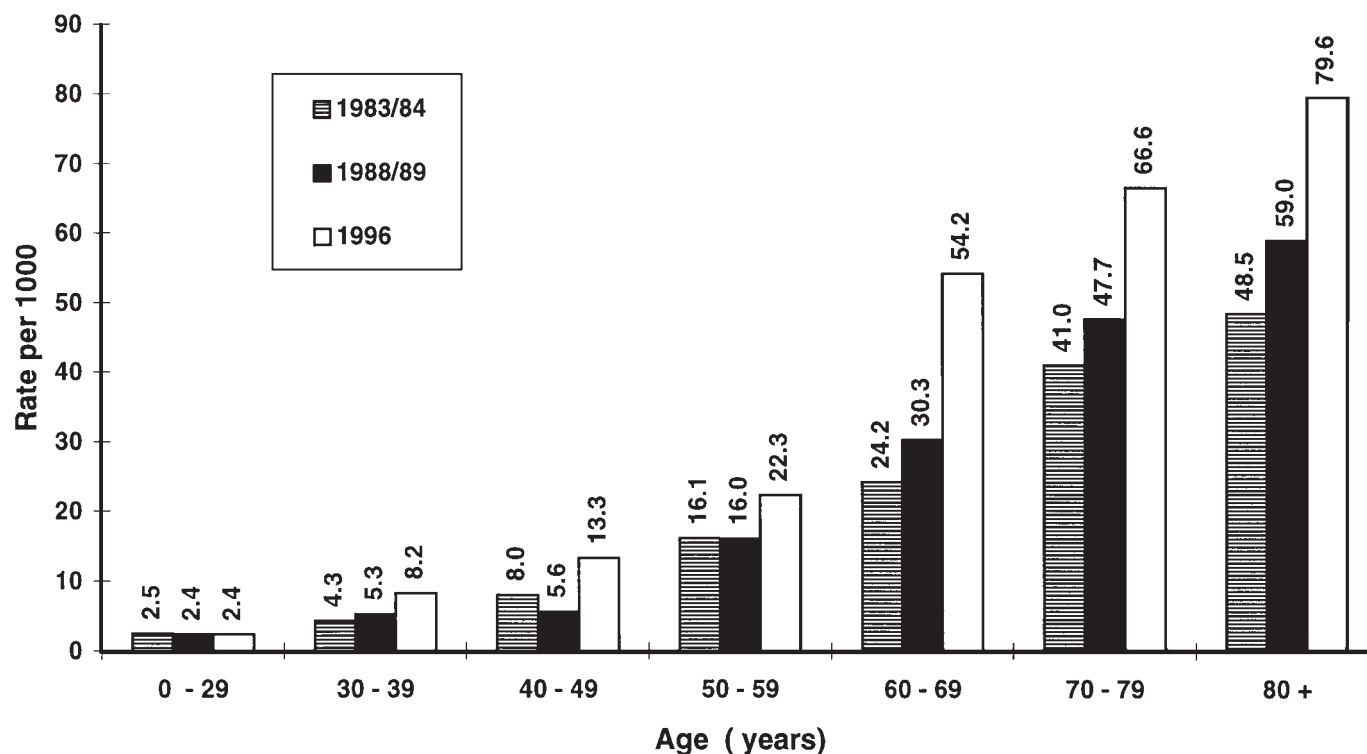
^aLogistic regression model, adjusted for age (and sex for all DM).^bDirectly standardized to the 1991 age distribution UK census.⁹

Figure 1. The prevalence of diagnosed diabetes in men in the Poole area over the study period: age specific rates

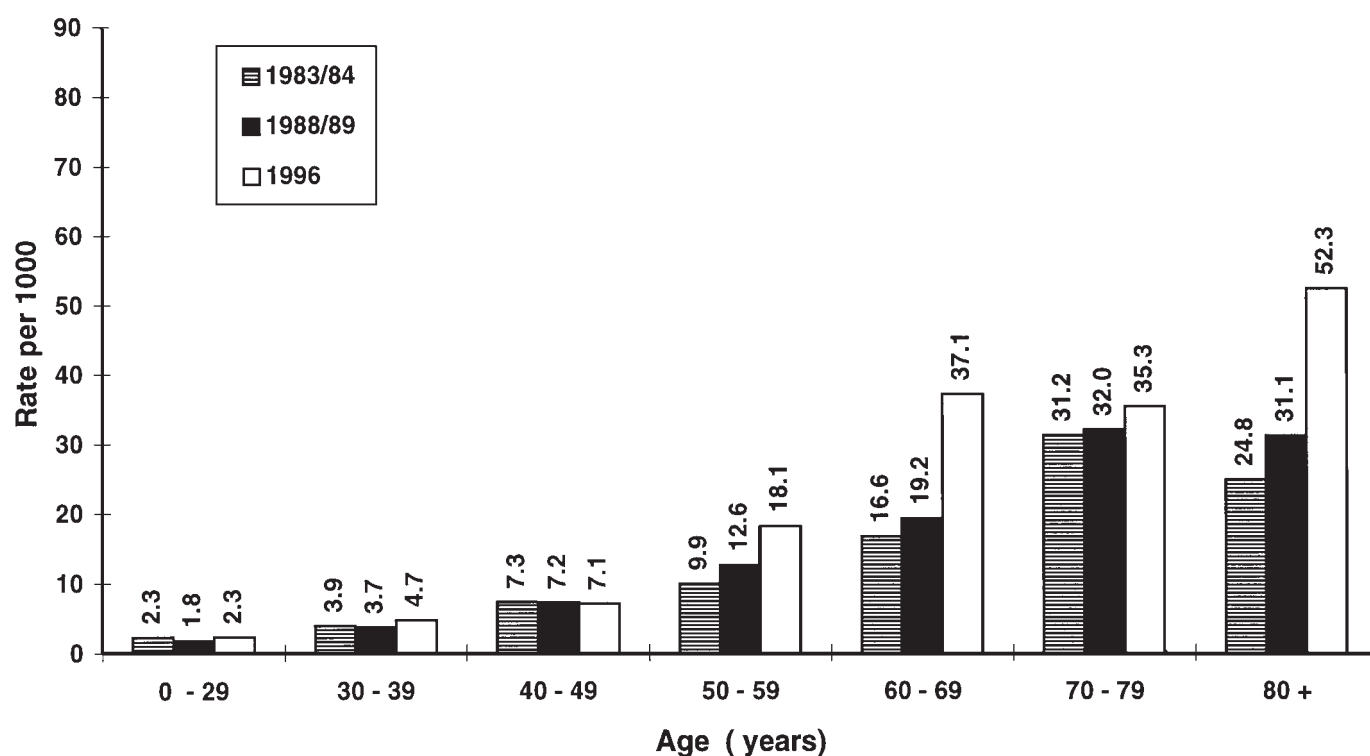


Figure 2. The prevalence of diagnosed diabetes in women in the Poole area over the study period: age specific rates

Table 4. The prevalence of diabetes mellitus in the UK: summary of other comparable studies

Author	Place	Year	Population	WHO criteria	Crude prevalence (%)	Age adjusted prevalence (%)
Mather ¹⁰	Southall	1984	65 057	?	1.20 ^a	1.05 ^a
Neil ²	Oxford	1982	40 079	?	1.08	1.04
Gibbins ¹¹	Powys 6 GP practices	? 1988	46 400	No	1.01 range 0.78–1.16	
Higgs ¹²	Trowbridge	1988/9	31 000	No	1.31	1.26
Meadows ¹³	Bristol 8 GP practices	1992/3	71 599	No	range 1.23–2.14	range 1.31–2.51
Benett ¹⁴	Manchester 64 GP practices	? 1992	285 033	No	1.21 range 0.49–2.15	
Dunn ¹⁵	Poole 36 GP practices	1992/3	256 130	No	1.6 range 0.8–2.6	
Howitt ³	Tunbridge Wells 41 GP practices	? 1992	230 000	No	1.18 range 0.5–2.0	
Fleming ⁴	48 GP practices in UK	1993	353 977	No	1.6 range 1.2–2.8	
Morris ¹⁶	Tayside 78 practices and 3 trusts	1996	391 274	Yes	1.94 %	

^aCaucasian population results.

To date, there have been no local screening studies which could help establish whether the increase in diabetes mellitus is due to previously undiagnosed cases being diagnosed or a true increase in the total prevalence of diabetes mellitus in the community. Population studies where screening for diabetes mellitus has been undertaken in the UK have shown a significant number of undiagnosed cases, with the total prevalence of diabetes rising to 9.3 % in 65 to 85 year olds in Melton Mowbray¹⁹ and to 6 % in 40 to 64 year olds in Ely.²⁰

In the Poole study, the prevalence of diabetes mellitus was higher in men than women throughout the study period and this difference was present in virtually all age groups. This sex difference is the reverse of that seen in an American study in 20 to 74 years olds where both diagnosed and undiagnosed diabetes was more common in women, except in the 65 to 74 year old age group.²¹ Two Scandinavian studies have also reported higher prevalence of diabetes in women than men^{22,23} whereas the study in Iceland showed similar results to the Poole study. Of the UK studies listed in Table 3, only Fleming⁴ reported the prevalence according to sex and he too found a higher prevalence in men aged 15 years and over. A recent study of new cases of diabetes over a 20-year period found a higher incidence of diabetes in men than women.²⁴ However, studies where UK populations have been actively screened for diabetes have shown a more diverse picture. In the Coventry study, the total prevalence of Type 2 diabetes mellitus was higher in the female Caucasian population.²⁵ In the smaller Isle of Ely diabetes project, the prevalence of newly diagnosed diabetes was marginally higher in men, 4.7 %, than women, 4.4 %.²⁰

In conclusion, we have demonstrated an 84 % increase in the crude prevalence (61 % increase in the age adjusted prevalence) of diagnosed diabetes in the Poole area over a period of 13 years predominantly due to Type 2 diabetes mellitus but also involving a small but significant increase in Type 1 diabetes mellitus. These population data will be valuable for diabetes health care planning in the UK. If this trend continues at the same rate over the next decade, a considerable increase in resources for diabetes care will be required.

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